

CLAIMS

What is claimed is:

1. A sensor for detecting a target analyte, comprising:
a working electrode comprising a molecularly imprinted polymer, wherein the molecularly imprinted polymer is imprinted with the target analyte.
2. The sensor of claim 1, further comprising:
a counter electrode;
a reference electrode;
a potentiostat; and
a phase analyzer, wherein the working electrode, the counter electrode and the reference electrode are connected to the potentiostat and wherein the potentiostat is connected to the phase analyzer.
3. The sensor of claim 2, wherein the material for the counter electrode is selected from platinum, gold, titanium, silver, copper and combinations thereof.
4. The sensor of claim 3, wherein the counter electrode has a form selected from mesh, wire, flag, sheet, bar and combinations thereof.
5. The sensor of claim 2, wherein the material for the counter electrode is selected from carbon, graphite and combinations thereof.
6. The sensor of claim 5, wherein the counter electrode has a form selected from mesh, wire, flag, sheet, bar and combinations thereof.
7. The sensor of claim 2, wherein the reference electrode is selected from a silver/silver chloride electrode, a platinized platinum electrode, and a calomel electrode.

8. The sensor of claim 2, wherein material for the reference electrode is selected from platinum, gold, silver, copper, titanium and combinations thereof.
9. The sensor of claim 2, wherein the reference electrode is a miniaturized saturated calomel electrode.
10. The sensor of claim 2, further comprising:
a processor, wherein the processor is connected to the phase analyzer.
11. The sensor of claim 10, wherein the processor is selected from an analogue processor and a digital processor.
12. The sensor of claim 10, wherein the processor performs electrochemical impedance spectroscopy analysis on a fluid contacting the working electrode.
13. The sensor of claim 10, wherein the processor is selected from a desktop computer, a laptop computer, a personal digital assistant, and combinations thereof.
14. The sensor of claim 1, wherein the working electrode further comprises a substrate.
15. The sensor of claim 14, wherein the molecularly imprinted polymer coats the substrate.
16. The sensor of claim 14, wherein the substrate is electrically conductive.
17. The sensor of claim 16, wherein the substrate is selected from copper, aluminum, platinum, titanium, gold, and combinations thereof.
18. The sensor of claim 16, wherein the substrate is a metal.
19. The sensor of claim 14, wherein the substrate is electrically non-conductive and wherein the substrate is plated with an electrically conductive material.

20. The sensor of claim 19, wherein material of the non-conductive substrate is selected from silica, silica wafers, alumina, alumina plates, polyimide, Teflon, cyanate ester, Kevlar, and combinations thereof.

21. The sensor of claim 19, wherein the material of the non-conductive substrate is selected from printed circuit board, glass epoxy board FR-4, glass epoxy board FR-5, and combinations thereof.

22. The sensor of claim 19, wherein the electrically conductive material is selected from gold, aluminum, silver, platinum, copper and combinations thereof.

23. The sensor of claim 1, wherein the working electrode is pressed molecularly imprinted polymer.

24. The sensor of claim 2, further comprising:

an electrolyte, wherein the working electrode, the reference electrode and the counter electrode are immersed in the electrolyte.

25. The sensor or claim 24, wherein the reference electrode and the counter electrode is a common electrode.

26. The sensor of claim 24, wherein the electrolyte is selected from a buffer solution, deionized water, an organic solution, a biological solution, and combinations thereof.

27. The sensor of claim 24, wherein the electrolyte is selected from phosphate buffer solution, Tris buffer solution, and combinations thereof.

28. The sensor of claim 24, wherein the electrolyte is selected from blood, urine, blood plasma, and combinations thereof.

29. The sensor of claim 1, wherein the target analyte is a biomolecule.
30. The sensor of claim 29, wherein the biomolecule is selected from a protein, a glycolipid, a lipid, a polysaccharide, and a polynucleotide.
31. The sensor of claim 1, wherein the target analyte is selected from a virus and a bacterium.
32. The sensor of claim 1, wherein the molecularly imprinted polymer is prepared by a method comprising:
- dissolving a print molecule and a monomer in a first phase and dissolving a host polymer in a second phase, wherein the first and second phases are different phases and selected from an aqueous phase and an organic phase;
 - preparing an emulsion of the aqueous phase and the organic phase;
 - polymerizing the monomer to form a polymer composite with the host polymer along in interface between the first and second phases; and
 - removing the print molecule from the composite.
33. A sensor for detecting a target analyte, comprising:
- a chip assembly comprising one or more working electrodes, wherein the one or more working electrodes comprise a molecularly imprinted polymer, and wherein the molecularly imprinted polymer is imprinted with the target analyte.
34. The sensor of claim 33, wherein the chip assembly further comprises:
- one or more reagent reservoirs;
 - one or more sample reservoirs; and
 - a fluid channel in fluid communication with the one or more reagent and sample reservoirs, and with the one or more working electrodes.
35. The sensor of claim 34, further comprising:
- a reference electrode;
 - a counter electrode;

a potentiostat; and

a phase analyzer, wherein the reference electrode and the counter electrode are in fluid communication with the fluid channel, and wherein the working electrode, the counter electrode and the reference electrode are in electrical communication with the potentiostat, and wherein the potentiostat is in electrical communication with the phase analyzer.

36. The sensor of claim 35, wherein the counter electrode is a metal.

37. The sensor of claim 35, wherein the material for the counter electrode is selected from platinum, gold, titanium, copper, silver and combinations thereof.

38. The sensor of claim 35, wherein the reference electrode is a metal.

39. The sensor of claim 35, wherein the reference electrode is selected from platinum, gold, titanium, copper, silver and combinations thereof.

40. The sensor of claim 35, wherein the reference electrode and the counter electrode are formed on a substrate.

41. The sensor of claim 35, wherein the one or more working electrodes are formed on a substrate.

42. The sensor of claim 41, wherein the substrate is electrically non-conductive, wherein the substrate is plated with an electrically conductive material, and wherein the one or more working electrodes comprise the electrically conductive material.

43. The sensor of claim 42, wherein the electrically conductive material is a metal.

44. The sensor of claim 42, wherein the electrically conductive material is selected from gold, platinum, copper, silver, titanium, aluminum and combinations thereof.

45. The sensor of claim 41, wherein the substrate is a material selected from silica, silica wafers, alumina, alumina plates, polyimide, Teflon, cyanate ester, Kevlar, and combinations thereof.
46. The sensor of claim 41, wherein the substrate is a material selected from printed circuit board, glass epoxy board FR-4, glass epoxy board FR-5, and combinations thereof.
47. The sensor of claim 33, further comprising:
a digital processor; and
means for conducting electrochemical impedance spectroscopy on a fluid contacting the one or more working electrodes, wherein the digital processor is in electrical communication with the means for conducting electrochemical impedance spectroscopy.
48. The sensor of claim 47, wherein the means for conducting electrochemical impedance spectroscopy comprises:
one or more input amplifiers;
a wide analog-to-digital converter.
49. The sensor of claim 47, wherein the digital processor is selected from a personal computer, a main frame computer, a personal digital assistant and a laptop computer.
50. The sensor of claim 34, further comprising:
an electrolyte, wherein the one or more working electrodes, the reference electrode and the counter electrode are immersed in the electrolyte.
51. The sensor of claim 50, wherein the electrolyte is selected from a buffer solution, deionized water, an organic solution, a biological solution, and combinations thereof.
52. The sensor of claim 51, wherein the electrolyte is selected from blood, urine, blood plasma, and combinations thereof.
53. The sensor of claim 33, wherein the target analyte is a biomolecule.

54. The sensor of claim 53, wherein the biomolecule is selected from a protein, a glycolipid, a lipid, a polysaccharide, and a polynucleotide.

55. The sensor of claim 33, wherein the target analyte is selected from a virus and a bacterium.

56. The sensor of claim 33, wherein the molecularly imprinted polymer is prepared by a method comprising:

dissolving a print molecule and a monomer in a first phase and dissolving a host polymer in a second phase, wherein the first and second phases are different phases and selected from an aqueous phase and an organic phase;

preparing an emulsion of the aqueous phase and the organic phase;

polymerizing the monomer to form a polymer composite with the host polymer along in interface between the first and second phases; and

removing the print molecule from the composite.

57. A method for determining the presence of a target molecule in an analyte, comprising:

placing a working electrode, counter electrode and reference electrode in fluid communication with an electrolyte and an analyte;

exerting an electrical potential between the working electrode and the reference electrode;

perturbing the electrical potential;

measuring the impedance between the electrolyte and the working electrode with the electrical potential constant, wherein the working electrode comprises a molecularly imprinted polymer.

58. The method of claim 57, further comprising:

matching the measured impedance to a known impedance for a concentration of the target molecule, wherein impedance is a function of the concentration of the target molecule.

59. The method of claim 57, wherein the working electrode further comprises a substrate.

60. The method of claim 59, wherein the substrate is coated with the molecularly imprinted polymer.